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(19) (CA) **CANADIAN PATENT** (12)

(54) Water Backup Alarm System

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473268

ABSTRACT

A self-contained signalling device for insertion into a pipe of a drain system, such as a sewage system including a septic tank, the device being capable of emitting a signal, such as a pulsating sound, when the level of liquid in the pipe reaches a predetermined level. The device includes an alarm portion which includes a circuitry having a power source and signal emitting component, such as a horn, and electrodes which cause activation of the signal emitting component when the electrodes are contacted by the liquid in a back-up condition. The device further includes a member which carries the alarm portion and engages the pipe for holding the alarm portion in a preselected position in the pipe. The device is designed to enable a householder to readily insert it in a pipe, such as in the floor drain, and from time to time remove it for battery replacement without acquiring the services of skilled personnel. By properly placing the device in a floor drain pipe or inside of a clean-out opening, the householder is made aware of a failure in the sewer system and can then take action to prevent excessive damage which might otherwise be caused by the back-up reaching the stage of flooding a large area within the house.

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This invention relates to an alarm device for insertion into a pipe in a drainage system for detection of a back-up condition.

In sewage systems of the type including a septic tank, it is not uncommon for the action within the septic to fail due to a collection of material which the tank cannot process or for the weeping tile connected to the septic tank to become plugged so that liquids cannot flow from the septic tank. As a result a back-up condition occurs in the pipes leading to
10 the septic tank. If such a condition is not immediately detected, it can result in sewage flowing into the house from various points in the system, such as a basement floor drain. This type of occurrence is not only extremely unpleasant but can cause considerable damage to various parts of the house and its contents. Accordingly, it is obviously desirable to provide some type of detection means which is capable of detecting a back-up at an early stage and provide a signal to the householder of a problem in the sewage system.

Even in sewer systems which are connected to a municipal
20 network, it is not uncommon to encounter back-ups because a storm overloading the conduits or because of blockages, such as those caused by roots of trees. In any event, any unexpected back-up can be very destructive.

There appears to be few, if any, items on the market which could be used as such an alarm, and particularly one which could be readily installed without the services of skilled personnel. There is shown in Canadian Patent 649,869, granted October 9, 1962, to Mocarski, a liquid level signal device for use in detecting a high water level condition in a septic
30 system, but the device is of a type which requires modification

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to the soil pipe and likely the skills of a plumber and an electrician for installation. Moreover, the device appears to be of a type which could only be practically installed when the septic system is being installed.

It is an object of the present invention to provide an inexpensive alarm device which can be readily installed and serviced by a householder.

10 According to the present invention there is provided an alarm device for detecting a back-up condition in a pipe of a drain system, the device including a self-contained alarm means for emitting a detectable signal and a mounting means for releasably holding the device in a preselected position in the pipe. The alarm means has means for carrying an energy source in a circuitry including a sensing electrode means located for contact by a liquid at a level above a normal level for the liquid in the pipe. The circuitry has means for energizing a signal producing means on closing of a circuit by contact of the sensing means by the liquid.

20 More specifically, the sensing means may be in the form of an exposed electrode. In the illustrated embodiment a pair of electrodes are provided to form a closed circuit when the liquid contacts both electrodes.

In a specific embodiment of the invention, the means for emitting a detectable signal is sound signal means, such as a pulsating horn.

Reference is now made to the accompanying drawings which show examples of the invention, wherein:

Figure 1 is a cross-section view through a drain pipe showing one embodiment of the invention installed therein;

Figure 2 is an elevational view of the embodiment shown in Figure 1 with the hood thereof removed;

Figure 3 is a schematic of the electrical portion of the alarm of the device; and

Figures 4 to 6 are views similar to Figure 1, but on a smaller scale and illustrating a variety of mounting arrangements of different embodiments of the invention.

In Figures 1 and 2, the reference number 10 generally denotes the alarm device of the present invention, the alarm device including a self-contained alarm means 11 carried by a mounting means 12. The device 10 may be positioned, for example, in a vertical pipe 13 which communicates with a substantially horizontal pipe 14 forming part of a drain system (not shown) of a house or other building. The pipe 14, which may lead to a septic tank or the conduit of a municipal drain network, is located below a floor 15, and the upper end of pipe 13 extends to the upper floor system so as to provide an opening for a floor drain, the upper end of pipe 13 being closed by a removable apertured cover 16.

The mounting means of the embodiment shown in Figures 1 and 2 consists of a plate or sheet 17 of plastic material, such as 1/8" thick PVC, which is sufficiently flexible to permit the user to form it into a roll manually with the alarm means 11 being on the inside of the roll. The plastic sheet material is rolled into a sufficiently small shape so as to be insertable endwise into the upper end of vertical pipe 13. As will be described in more detail below this device is lowered to a desired point, and when released by the user it will attempt to unroll so as to thereby engage the inner cylindrical wall of the pipe 13. The resiliency of the sheet is sufficient to cause the device to be frictional held in the position selected by the user, and it will therefore not slide further down the

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pipe 13. In the embodiment of Figures 2 and 3 the self-contained alarm means 11 is mounted directly on a portion of the plate or sheet 17. The alarm means 11 includes a circuitry 20 carried by the sheet 17. In the circuitry there is provided a means 21 for emitting a detectable signal, a source of electrical current 22 and an electrode means 23. The electrode means 15 shown in the form of a pair of spaced, zinc plated electrodes located adjacent the bottom of sheet 17. It is not essential to utilize a pair of electrodes 24,24 as the pipe 13, if formed of appropriate material, or a strip of metal fastened to the plate may be utilized as a common ground. For the sake of simplicity and reliability, it is believed best to utilize the pair of electrodes which are shown as being spaced in the horizontal direction.

Located above the electrodes 24,24 are clips 25,25 for holding a battery 26 which may be in the form of a replaceable battery of the 9 volt type. Contact means 27 of a well known type is provided for snapping onto the terminals of battery 27 for connecting the battery into the circuitry and this provides the source of electrical current for the alarm. The means for emitting a detectable signal 21 may be in the form of a pulsating horn 30 and is affixed to the sheet 17 above the battery 27.

Figure 3 shows the pulsating horn 30, which may be in the form of a Piezo horn connected in a control circuit, shown generally at 31, and adapted to indicate a low resistance condition between sensing electrodes 24 and 24a. Circuit 20 has a transistor 34 having its collector connected to one terminal of the horn via a resistor 32. The emitter is connected to one terminal of the power source or battery 26, with the other

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terminal of the power source connected to the other terminal of horn 30 and to sensing electrode 24a. The base of transistor 34 is connected to the sensing electrode 24 via a resistor 33.

In operation, the occurrence of a low resistance condition between sensing electrodes 24 and 24a, such as the liquid extending between the electrodes, biases transistor 34 into conduction and when the transistor is saturated connects the power source across the controlled horn 30 to give an audible warning.

- 10 To protect the alarm means from any water which may run through the floor drain from above the floor, a hood number 36 is detachably clamped over at least the upper part of the circuitry, including the horn 30.

When the device is mounted into the pipe 13, it is located so that the pair of electrodes 24, 24a are positioned well above the bottom of pipe 14, so that water or liquid which may run through pipe 14 under normal conditions will not set off the alarm. However, as a back-up condition commences, pipe 14 may eventually become full and start to rise in pipe 13.

- 20 As the liquid contacts the electrodes 24, 24a, the operation of the electrical system operates as described above.

In a sewage system which does not include a floor drain but includes a screwed in clean out plug in the Y fitting normally located in a basement wall at the location where the main soil pipe extends to an eternally burned septic tank, the device can be located in the horizontal leg of the Y fitting by simply removing the plug, inserting the device and replacing the plug. Piezo horns which produce a sufficiently shrill or loud noise are available so that the alarm can be heard at
30 different locations in a house, even though the alarm is

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completed enclosed in the drain system. Alternatively, it is possible to utilize in place of the horn a means which will transmit a radio signal or an ultra-sonic sound for activating a receiver at some distance from the alarm device, and the receiver can then be used in conjunction with some other means, such as a sound producing element, light or both for the purpose of attracting the householder.

10 The embodiment shown in Figure 1 is provided with the hood member 36, but alternatively the interior circuitry, with the exception of electrodes, could be sprayed with a water proofing coating. Even when the hood is used, such a coating may still be deservable for at least part of the circuitry as protection against the moist conditions to which the device is exposed.

Instead of mounting the alarm means on the flexible sheet shown in Figures 1 and 2, other mounting means, such as those shown in Figures 4 to 6 can be used.

20 The mounting means 12 in Figure 4 consists of a tubular member 40 having a smaller outside diameter than the interior of pipe 13. The alarm means 11 is fastened to the interior of the tubular member. The lower portion of the tubular member is perforated, as shown at 41, so that liquid can still pass along the horizontal pipe 14. The tubular member, like most other variations of the mounting means, is preferably made of a plastic material.

In Figure 5, the mounting means 12b is in the form of a resilient coil inside of which is fastened the alarm means 11. The coil is preferably made of a length approximately equal to the average distance from the bottom of pipe 14 to the
30 top opening at pipe 13 so that as the cover 16 is installed

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it slightly compresses the coil. The coil may be formed of material which can be readily cut so that its length could be shortened at the time of installation.

In the embodiment of the mounting means 12c in Figure 6, the alarm means 11 is mounted in the middle of a moulded plastic member having a plurality of outwardly radiating resilient fingers 42, the outer extremities of which engage the interior of pipe 13 so as to hold the alarm in a preselected position.

- 10 In addition to the various mounting means shown in Figures 4 to 6, other arrangements are possible. For example, a sleeve with a flared upper end could be utilized, the flared end being adapted to engage the upper end of pipe 13 so that the sleeve, with the alarm means fixed therewithin hangs within the pipe 13. The mounting means could include a base with an adhesive surface for permanently sticking to the interior of pipe 13 and clamp means for holding a removable plate carrying the alarm means to the base. Alternatively, the support means could be formed as an interragal part of the drain cover 16
- 20 so that the alarm hangs suspended therefrom whereby the householder need only remove the existing cover and replace it with the unit including the new cover which holds the alarm device within pipe 13.

Various other modifications to the described embodiments, which have been presented as examples, will be obvious to those skilled in the art without departing from the spirit of the invention as defined in the accompanying claims.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE
PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. An alarm device for detecting a back-up condition in a pipe of a drain system, said device comprising a self-contained alarm means for emitting a detectable signal and a mounting means for releasably holding said device in a preselected position in said pipe, said alarm means having means for carrying an energy source in a circuitry including sensing means located for contact by a liquid at a level above normal in said pipe, said circuitry having means for energizing a signal producing means on closing of a circuit by contact of said sensing means by the liquid.

2. A device as defined in claim 1, wherein said sensing means includes an exposed electrode.

3. An alarm device for providing a sound alarm on detection a high liquid level condition in a pipe of a drain system, said device comprising a self-contained alarm means and a mounting means carrying said alarm means; said alarm means including electrical circuitry connected to a pair of spaced electrodes, a source of electrical current and a sound signal means, said circuitry being arranged to activate said sound signal means on liquid contacting both of said electrodes; said mounting means being engageable with said pipe for removable placement of said device in said pipe whereby said alarm means is readily placeable in a selected position wherein said electrodes are both contacted by liquid when the liquid in the pipe reaches a predetermined level due

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to a back-up in said drain system.

4. A device as defined in claim 2, wherein said mounting means includes a resilient member requiring deformation for achieving insertion into said pipe.

5. A device as defined in claim 4, wherein said mounting means includes a plate portion arranged for substantially vertical orientation when placed in said pipe, means mounting said electrodes on a relatively lower section of said plate, battery mounting means and said sound signal means being mounted on said plate portion above said electrodes.

6. A device as defined in claim 5 and including hood means mounted over said circuitry.

7. A device as defined in claim 4, 5 or 6, wherein said mounting means includes a plastic sheet material having sufficient flexibility to permit rolling thereof into a shape to substantially conform to the interior of said pipe.

8. A device as defined in claim 3, 4 or 5, wherein said sound signal means is a pulsating horn.

9. A device as defined in claim 3, 4 or 5, wherein said source of electrical current is a removable dry cell battery.

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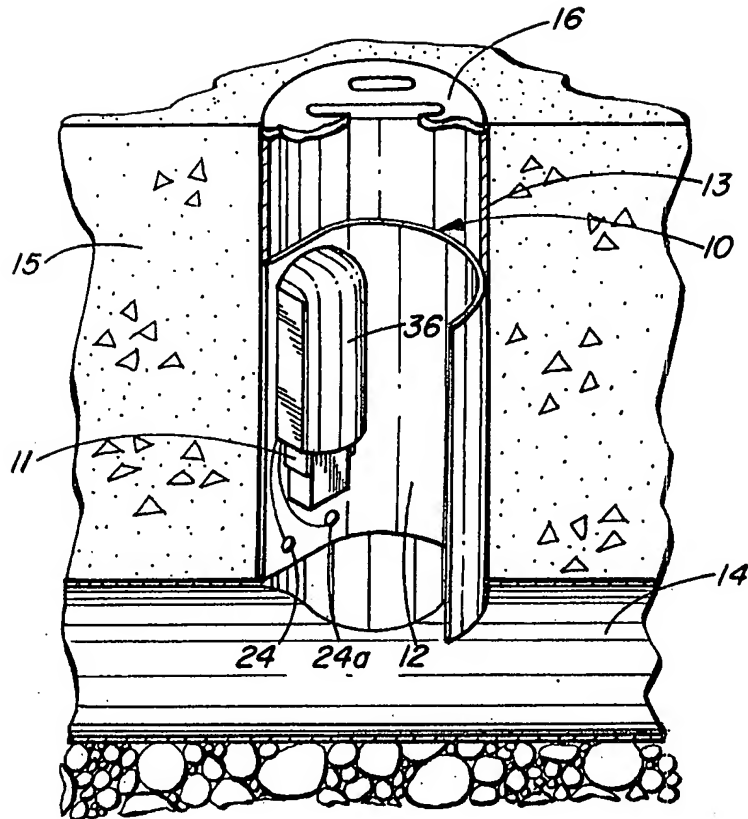


FIG. 1

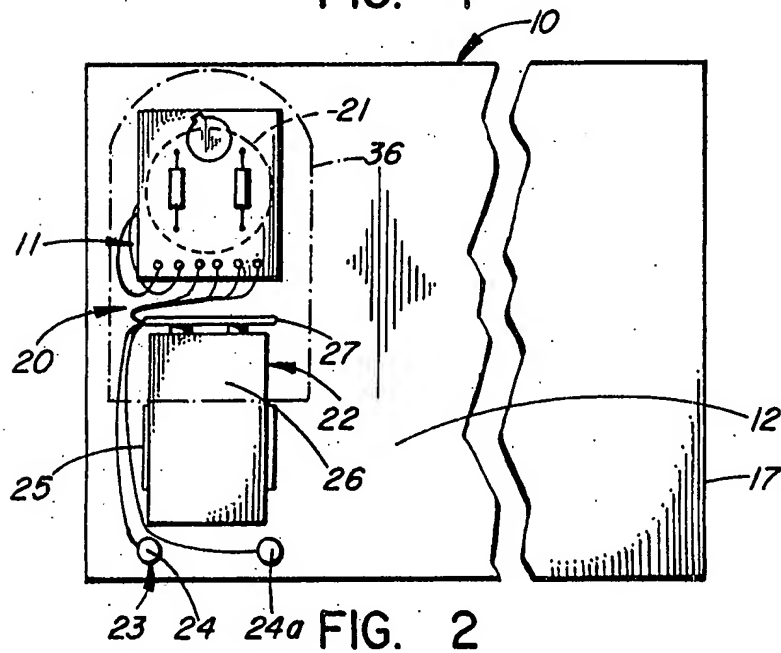


FIG. 2

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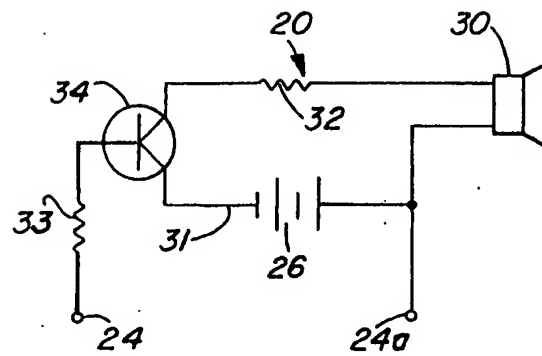


FIG. 3

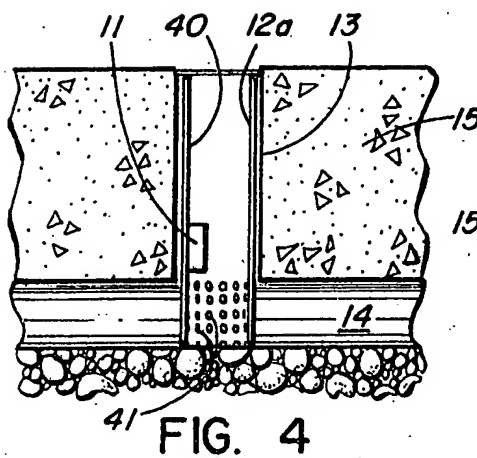


FIG. 4

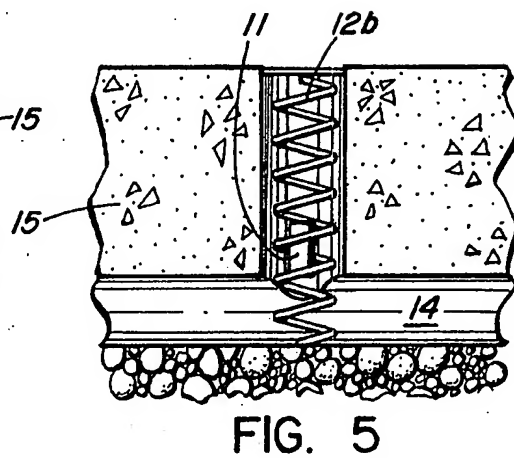


FIG. 5

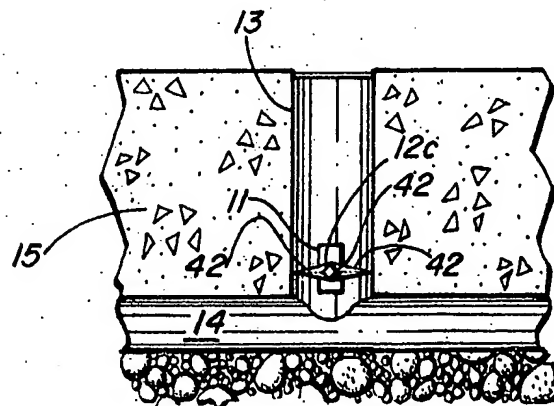


FIG. 6

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